

Claims

- [c1] What is claimed is:
1. An shallow trench isolation (STI) method for semiconductor processes, the method comprising:
 - providing a substrate having a top surface;
 - forming a trench-patterned mask layer on the top surface exposing an unmasked trench region of the substrate, the mask layer comprising a pad oxide layer, and a silicon nitride layer formed on the pad oxide layer;
 - etching the unmasked region of the substrate to form a trench in the substrate;
 - depositing a high temperature oxide (HTO) film over the substrate, the HTO film covering the trench and the mask layer;
 - depositing a dielectric layer that fills the trench and covers the HTO film;
 - planarizing the dielectric layer to expose the silicon nitride layer; and
 - stripping the silicon nitride layer;wherein the HTO film reinforces an interface between the dielectric layer and the substrate to prevent acid penetration and acid-corroded seams forming during the acid solution dipping process.
 - [c2] 2. The method of claim 1 wherein the HTO film is formed by a low-pressure chemical vapor deposition (LPCVD) process, the LPCVD process utilizing a $\text{SiH}_2\text{Cl}_2/\text{N}_2\text{O}$ gas system, a pressure of 0.4 Torr, and a temperature between 700 °C and 850 °C.
 - [c3] 3. The method of claim 1 wherein the HTO film has a thickness between 50 and 250 angstroms.
 - [c4] 4. The method of claim 1 wherein the dielectric layer is a high density plasma (HDP) oxide layer.
 - [c5] 5. The method of claim 1 wherein before stripping the silicon nitride layer, the method further comprises performing a silicon oxide etching process to remove residual silicon oxide from the silicon nitride layer and to simultaneously etch the dielectric layer in the trench.
 - [c6] 6. The method of claim 1 wherein the acid solution dipping process uses a

diluted HF (DHF) solution.

[c7]

7. The method of claim 1 wherein a 160 ° C phosphoric acid solution is used to strip the silicon nitride layer.